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BULLETIN  
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Leaf-forms of *Populus grandidentata*.

BY N. L. BRITTON.

Plate LVII.

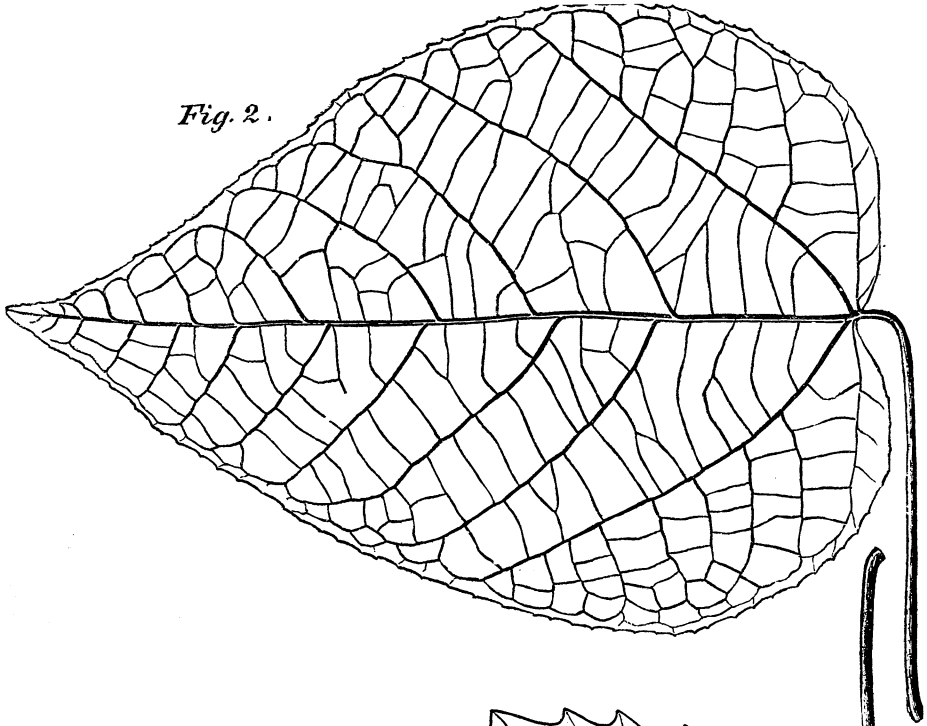
The difference in the form and outline of leaves borne by individual plants of different ages, though belonging to a single species, has often been the subject of remark. It is specially noticeable in trees, and all are familiar with the variation exhibited in this respect by Oaks, where it generally appears in larger, evidently more vigorous leaves, having less serration or lobing on the younger plants than on older ones. To this general habit the Poplars are no exception, but exhibit it, in certain cases, to a remarkable degree.

For several years I have repeatedly noticed sapling Poplars, in many places in the woods, bearing very large, ovate-cordate, serrulate, commonly somewhat acuminate leaves, their upper surfaces glabrous, the lower densely covered with a fine tomentum, which under the microscope is seen to consist of slender, simple hairs, extending over the very prominent veins, and commonly present on the petioles and young shoots. Until quite recently I had not been able to ascertain to which species these leaves belong. Their outline and serration somewhat resemble those of adult Cottonwoods (*P. monilifera*), specimens collected on the Palisades in October, 1883, being very much like these in outline; the tomentose lower surfaces suggested *P. heterophylla*, but no large trees could be found. In August of last year I obtained what would appear to be actual proof that they are borne by young trees of *P. grandidentata*. I first observed the relation of the two at a place on the banks of the Morris Canal, near Waterloo, New Jersey, while in company with Professor Porter, but later noticed it in several other localities. The adult trees of the Large Aspen were accompanied by numerous small ones bearing the tomentose, serrulate leaves in question. I could not definitely ascertain whether these saplings were root-suckers or seedlings, but as I have since been unable to find the peculiar leaves

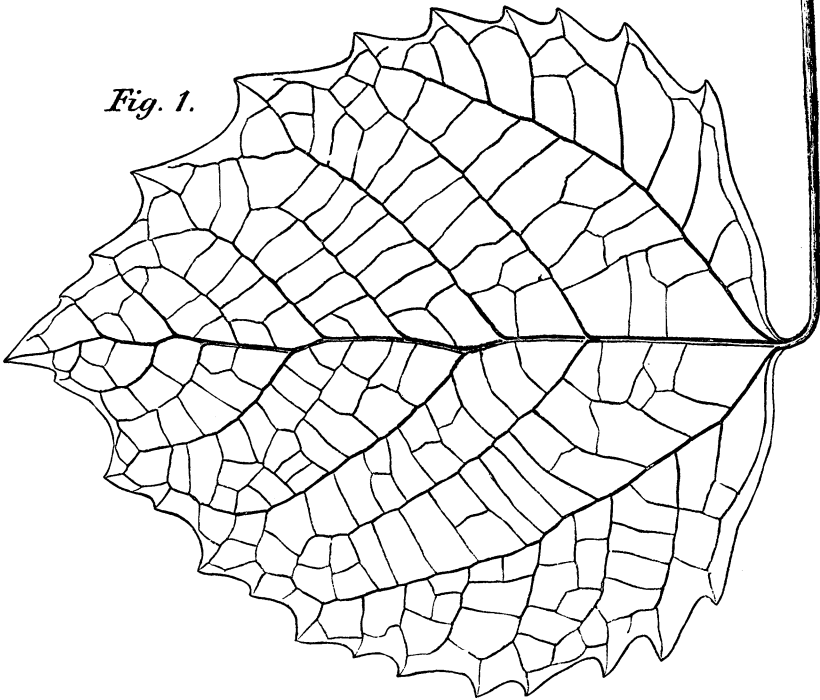
on the former, I suppose they were seedlings. On these small trees the tomentose leaves remain until they naturally drop off in the autumn, and I have so far seen but a single one of the two types on the same individual tree. The age when the normal leaves first appear I have been unable to determine, and it may vary in different localities; the tomentose forms were, however, seen on plants eight to ten feet high. The text-books make no allusion to this remarkable variation in leaf-form, nor have I been able to find it recorded in any literature at my command; frequent mention is made of the woolly surfaces of ordinary young leaves, a feature which exists even on those of large trees. The system of primary nervation is much the same in both types, though in the leaves of the saplings here alluded to, the mid-vein is straighter, and the disposition of the veinlets differ also in details.

*Populus grandidentata* was named by the elder Michaux (Flor. Bor. Amer., ii., p. 243.) He notes the villose younger leaves, but makes no reference to the serrulate ones of saplings. *P. heterophylla* is a Linnæan species, (Spec. Plant., 1st Ed., p. 1034; 3d Ed., p. 1464), but the diagnosis given is simply "*Populus foliis cordatus primoribus villosus.*" Now, a question arises as to which species Linnæus actually had. The above short description might apply equally well to the leaves of both, now that we have shown the character of sapling leaves of *P. grandidentata*. It would appear that Linnæus had not seen the fruit. The leaves of the Swamp Poplar, (*P. heterophylla*), so far as the living trees and herbarium specimens which I have seen represent it, vary very little in shape; they are quite uniformly broadly ovate, obtuse, and generally though not invariably cordate, so that the Linnæan name does not well apply to them. In the *Sylva Americana* the tree is called *Populus argentæa*, which is a better name for it, while *heterophylla* would apply very well to the Large Aspen. Is it possible that Linnæus was aware of the variation described at the present time? The two species are very distinct, the racemose fertile inflorescence of the Swamp Poplar being characteristic, and not met with, I believe, in any other American species. In fruit the pedicels become half an inch or more in length, a character noted in Wood's Class Book.

*Fig. 2.*



*Fig. 1.*



I hope that the presentation of this subject at the present time may direct attention to these trees and that additional observations may be placed on record.

EXPLANATION OF PLATE LVII.

Fig. 1. Normal leaf of *Populus grandidentata*.

Fig. 2. Young sapling leaf of the same species.

**Duct Formation in Chestnut Wood.**

BY P. H. DUDLEY.

The large ducts in the inner portion of each annual ring of Chestnut wood are very conspicuous, attracting attention at once in the tranverse and radial sections. When cut slightly obliquely in the tangential section they form the beautiful and attractive contrast to the ordinary wood-cells which has long made the second growth of this wood so desirable for the interior finishing of cars, and, more recently, of houses. The large ducts form in one, two, and sometimes three quite distinct concentric rows in the early spring growth of each annual ring. The rings are not always alike in the same tree, owing to varying conditions of growth in different seasons, and marked variations are found in trees from different localities. Some of the ducts appear as soon as the wood-cells, being formed adjacent to the cells of the preceding year's growth, while others have only from one to three rows of cells between. In a specimen cut on May 1st, one row of ducts and eighteen rows of wood-cells had already formed. The leaves of this tree were only about one inch long and one-fourth of an inch wide, yet some of the ducts were of full size, well formed, having septa and well defined walls. In certain sections were found ducts evidently forming; they were small, but with distinct walls. Around these the wood-cells were of the usual shape and not much flattened, and the medullary rays not much bent out of their course. After comparing a number of more or less advanced ducts, it now seems to me that they increase in size by expansion instead of by absorbing the surrounding cells. If the formation of these ducts were a process of absorption, some of the medullary rays should end at the ducts, and not be flattened around them, as I have found to be the case in all specimens so far examined. In the section before mentioned